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251 pages of text, 19 pages of tables, 7 maps, 47 plates, 3 pages of contents and index

THE NEOTROPICAL SPECIES OF THE 'SUBGENUS AESCHNA' SENSU SELYSII 1883 (Odonata)

By Philip P. Calvert

This paper presents an account of the Neotropical species referred by de Selys in 1883 to his subgenus *Aeschna* and of some species unknown to him. His subgenus is here divided into three genera, *Aeschna, Coryphaeschna,* and *Castoraeschna, Aeshna* in its turn being subdivided into the subgenera *Aeschna, Hesperaeschna, Rhionaeschna, Schizuraeschna, Marmaraeschna* and *Neureclipa.* These five subgenera include 2, 15, 1, 3, 4 and 5 species and subspecies respectively. *Coryphaeschna* embraces 9 species and subspecies, *Castoraeschna* 5. Larvae of 2 species of *Hesperaeschna,* 1 species of *Schizuraeschna,* 1 species of *Neureclipa* and 6 species of *Coryphaeschna* are described and figured. Generalities are discussed under the headings: Relationships of the Neotropical Aeshnas to the North American fossils; Relations of the South American Aeshnas to the Palaearctic and Australian species; The geological age and geographical distribution of the ancestors of the Odonata and of the Mammalia; Relations of the Neotropical Aeshnas to each other; The seasonal distribution of the Neotropical species of Aeshna. Forty plates in black and white illustrate the structural and colorational features of the adults, seven those of the larvae. Nineteen tables show the variations in size and in venation of the adults. Six maps show the geographic distribution of all the species concerned. There is an alphabetical index of species, subgenera, genera, authors quoted, and topics.

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ENTOMOLOGICAL NEWS

VOL. LXVIII MARCH, 1957 No. 3

Variation in Weight, Developmental Rate, and Hatchability of Oncopeltus Eggs as a Function of the Mother's Age [1]

By A. GLENN RICHARDS and MARJORIE Q. KOLDERIE,
Department of Entomology and Economic Zoology,
University of Minnesota

It is well known that egg production of various insects may be greatly affected by environmental conditions and the past history of the mother. But it is commonly assumed that eggs laid by females raised and kept under standard conditions will be the same irrespective of the age of the female. We unconsciously assumed this in experiments with the milkweed bug, *Oncopeltus fasciatus* (Dallas), until it became evident that such was not strictly true. To be sure, a considerable literature on the influence of parental age has accumulated for some groups of organisms (see Strong, 1954) but only recently has the phenomenon been measured in insects (Durrant, 1955; Sang, 1956).

The manner in which many insect species are cultured in the laboratory leads to the production of distinct broods rather than a population containing all stages of the life cycle. Commonly, then, there occur periods when the stage desired is not available. As soon as the desired stage becomes available it is used. Proceeding in this manner we encountered unexpected trouble. The number of hours required for incubation at various temperatures had previously been satisfactorily taken from the data

[1] Paper No. 3697, Scientific Journal Series, Minnesota Agricultural Experiment Station, St. Paul 1, Minnesota.

Acknowledgment is due to the National Science Foundation for a grant supporting this research project.

of Lin *et al.* (1954). The data given by Lin *et al.* were obtained from eggs collected during the peak of egg laying periods, *i.e.*, when the females were two–three weeks post emergnce. We have now found that the data of Lin *et al.* are valid for eggs laid during that period but are not valid for eggs laid early or late in the fecund stage. Partly to learn how precisely we needed to control the mother's age in the sense of restricting egg collection to what portion of the fecund period, and partly because we needed weight and time data from a fairly large number of egg lots for another purpose (Richards, 1957), a systematic study was made of certain variables. This was repeated once; the general conclusions were the same in the two tests and both times fitted with discrepancies previously encountered in time of hatching. Only the more extensive set of data will be presented.

For the tests, five dozen teneral adults of *Oncopeltus* were segregated from the stock cultures. The number of each sex was not determined but presumably there were about half males and half females. This group was held under the same environmental conditions as they had grown under, *i.e.*, 25° C. and 60–75% R.H. Eggs will be dropped promiscuously in the culture if nothing is present that the female prefers. If small rolls of gauze or other open-mesh cloth are added, egg laying is stimulated and the eggs are laid in batches inside the roll of cloth by insertion of the ovipositor therein. The cloth rolls also provide a convenient method for obtaining eggs of known age since one has only to remove the roll of gauze after the desired interval and open it to extract the eggs. The eggs were counted and sorted into weighing bottles using a small soft brush. When the group was laying most actively, 400–600 eggs were used in each lot, but commonly fewer were available, and at the beginning and end of the egg laying period only a few dozen were available for each lot. The eggs were then incubated at 75% R.H. and usually 17° or 25° C. Subsequently, determinations were made of per cent hatching, average weights of the newly hatched larvae, and viability of the young bugs under standard favorable conditions.

Adult *Oncopeltus* at 25° C. begin mating 4–6 days after reaching the adult stage, and start laying eggs on the 5th to 8th day. At first only a few eggs are laid—perhaps only certain females begin this early. Thus, for data presented in fig. 1, no eggs were obtained on the 5th day, only 78 on the 6th day, 289 on the 7th day, but more than 1,500 on the 10th day. Egg production then reached a peak at about 20 days and remained almost at the same high level until about 40 days; then it fell off and became somewhat erratic. Very late in the test ($>$ 50 days), when only the most long-lived were still alive, egg production again dropped to a few dozen but the single venerable female which lived for 72 days laid 10 eggs shortly before dying.

As far as longevity of the adult is concerned, we have reason to believe that this group lived unusually long. In general, our segregated groups seem to have died sooner but we usually discard groups as soon as significant numbers are seen to have died. In one repeat test on longevity, all the females were dead after 41–44 days but some males lived to $>$ 50 days. Also, less complete data suggest that the peak egg production period is not constant from one generation to another. In the generation plotted in fig. 1, peak production occurred 18–20 days after ecdysis but in other generations it has been sooner (as low as 10–12 days). But, however long the groups live and whenever the peaks occur, egg production and egg weight are low the first few days of egg laying and fall off to low again near the end of life.

As shown in fig. 1, the first several batches of eggs are relatively light. In this test, the first group had an average weight of only 225 micrograms. Average weights then increased to a maximum of 280 micrograms in the period when maximum numbers of eggs were being produced. This is an increase of about 25%. Subsequent average egg weights then dropped but not constantly or with regularity in the period of 25–55 days of age. Terminal egg lots had very much lower weights (about 25% lower than the first lot and 40% lower than the maximum value). Averaging all the values together one obtains an over-all average of 255.0 ± 3.6 micrograms. A pre-

vious test that involved six lots collected at 8–22 days of female adult life gave somewhat lower values ranging 226–240 and averaging 234 micrograms. It will bear repeating that the range of 160–280 micrograms is a range of averages; the range of individual egg weights must be greater than this and may be very much greater. Even average values from the two halves of a single large batch of eggs may vary by several per cent (note 33 day group).

Freshly hatched larvae of course weigh less than the eggs from which they develop. But, surprisingly, at below about 20° C. there is a greater effect of temperature in slowing development than in slowing energy expenditure (Richards, 1957). One of the results of this is that whereas larvae from eggs incubated at 25° C. average 224.8 ± 3.2 micrograms, those from eggs incubated at 17° average 203.2 ± 2.7 μg., and those from eggs incubated at 15° C. average only 190.0 μg. Comparing values from matched eggs lots, the wet weight losses following incubation are 33 micrograms at 25°, 53 μg. at 17°, and 83 μg. at 15°. Compared to the 20–30° C. range, then, there is 1.6 × as much loss at 17°, and 2.5 × as much loss at 15°. As already pointed out elsewhere (Richards, 1957), the weight of eggs is not only correlated with their hatchability but seems to be one of the factors involved in successful hatching. In other words, lighter eggs have less stored food reserves. And since an egg contains only a finite amount of food and cannot get more, it follows that lighter eggs are less likely to give larvae that hatch successfully. It also follows that the variable hatching percentages obtained at and near threshold temperatures may be no more than an expression of the variation in egg weights in different batches of eggs. In fact, we have data showing that only the heaviest eggs can hatch at the threshold temperature of 15° C.

Incidentally, one can calculate the approximate amount of energy required for embryonic development from the weight losses. Extractions show that almost all of the dry weight loss at an incubation temperature of 25° C. is fat; the water content remains constant at 68–70%. From this and well-known aver-

age caloric values, one can calculate that only about a tenth of a gram calorie is required to complete the development through hatching for an *Oncopeltus* egg at 25° C. This is only enough energy to raise the temperature of one drop of water 2° C. or about 4° F.!

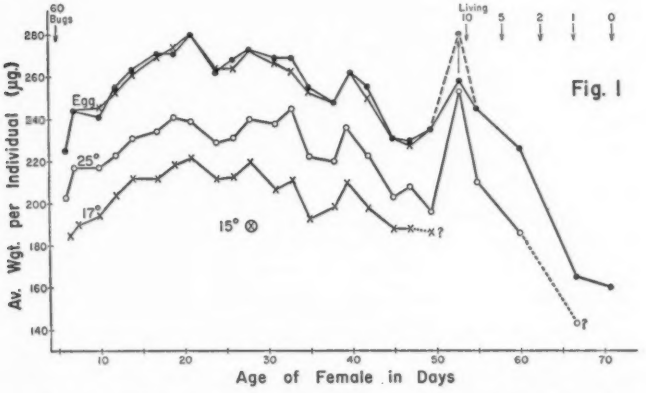

FIG. 1. Average weights of *Oncopeltus fasciatus* as a function of time after molting to the adult instar. Top curves give weights of freshly laid eggs; egg lots shown as solid circles incubated at 25° C. to give larvae plotted as open circles; egg lots shown as crosses incubated at 17° to give larvae plotted as crosses. A single value for larvae from eggs incubated at 15° shown at day 28. Most of the points represent averages from lots of 200–500 eggs but fewer eggs were available for the first two and the last five points.

The egg weight value at 53 days must have been erroneously recorded to judge from the weight of the larvae obtained; a calculated probable value is plotted and joined in by the broken line. The last points of each larval curve are queried because of low hatching percentage in these lots.

Hatchability of the eggs shows differences somewhat paralleling the weight differences (fig. 2). At 25° C., hatching rises from an initial value of 80% to the 92–96% range, and falls precipitously for eggs from old females. The differences are even greater at 17° where hatchability rises from 38% to nearly 90% (or even higher if rupture of the egg shell is taken as the criterion of hatching). Similar results were obtained in an earlier set of determinations.

Similarly, the rate of development is slower for eggs from the first and last parts of the fecund period (fig. 4). This quantitative difference implies a qualitative difference in the eggs that can hardly be just a matter of weight and amount of stored reserves. What the difference is remains to be determined but clearly early and late eggs develop more slowly. [In *Drosophila melanogaster,* Sang (1956) reports that the opposite is true, *i.e.,* the early and late eggs are about 10% faster than those of the peak middle period.]

There is, however, no clear cut difference in the viability of larvae that hatch until very late in the egg laying period (fig. 3). Larvae from eggs incubated at 25° C. are much more likely to grow to maturity when placed at optimum conditions than are ones that were incubated at 17°. Possible reasons for this are being discussed elsewhere (Richards, 1957).

The dips in the center of the curves in fig. 3 require some explanation. Near the end of the experiment M. Q. K. went away on vacation leaving these growing larvae to the tender ministrations of A. G. R. Her departure came when the larvae from 25° incubations of eggs from 38-day females and larvae from 17° incubations of eggs from 24-day females were growing. The precipitous drop in the 25° curve was due to known drowning of the 40-, 42- and 45-day lots, but the drop in the 17° curve was correlated with infrequent cleaning and renewal of seeds rather than accidental mortality. Then, M. Q. K. returned to tend the final few groups, and survival of 17° lots returned to what it had been.

This otherwise unfortunate episode does suggest an explanation of a previous discrepancy. Hodson and Al Rawy (1956) have reported that *Oncopeltus* larvae from eggs incubated at 25° grow satisfactorily whereas ones from eggs incubated at 17° all die. M. Q. K. had not been able to reproduce Al Rawy's results but A. G. R. did! Omitting the facetious language, eggs incubated at 17° give weak larvae only a minority of which survive under the best care, all of which die under care which will suffice for larvae from eggs incubated at 25°. [While the point was not proven, it seems that the lethal effect is due to

the development of mold on the milkweed seeds. Even at 75% R.H. which is rather low for mold growth, seeds must be changed and containers cleaned every 2–3 days for survival of larvae from eggs incubated at 17° C.]

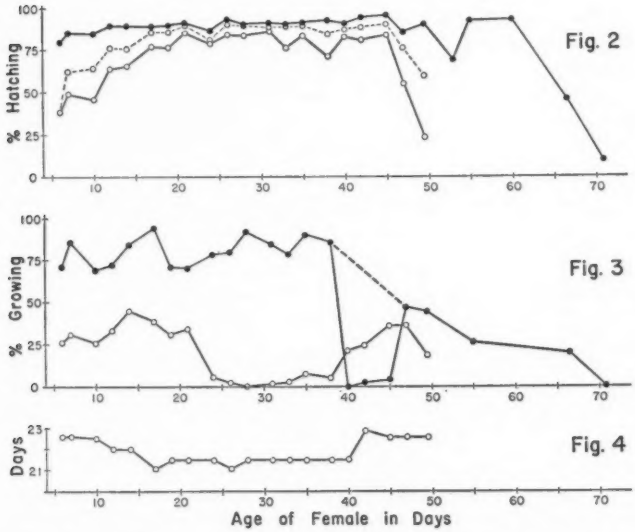

FIG. 2. Hatching percentages for *Oncopeltus* eggs incubated at 25° C. (solid circles) and 17° (open circles). Open circles connected by a solid line represent complete hatching; open circles connected by a broken line include those larvae that developed and broke the egg shell but did not emerge completely therefrom.

FIG. 3. Survival percentages for larvae reared at 25° C. and 75% R.H. from eggs incubated at 25° (solid circles) and 17° (open circles). The fall of the 25° curve to zero for the 40–45 day period was due to accidental deaths. See text for discussion.

FIG. 4. Days required for incubation and hatching at 17° C.

In conclusion, eggs are laid by *Oncopeltus* females from about one week after adult emergence until death. But very early and very late in the fecund period fewer eggs are laid, and these weigh less, take longer to develop, and give lower hatching percentages. These differences are mostly in the 10–20% range

but in extreme cases may be much greater. It follows that minimum variation *within a single collection* will be obtained by using eggs from females of a known standard age (and in practice greatest constancy is obtained with *Oncopeltus* at the peak egg production period). Conversely, maximum variability will be obtained from cultures or populations containing individuals of extreme ages plus ones in the peak production period. However, as Durrant (1955) points out, quantitative values vary from one generation to the next, and less variability may be encountered in summing data *from different generations* if a selected sampling procedure is used instead of restricting data to the progeny of mothers of a particular age.

All the data presented in the present paper deal with constant temperatures in incubator cabinets. This is satisfactory for showing physiological differences but we have reason to know that *Oncopeltus* has considerably narrower tolerance range under constant temperature conditions than under varying temperatures whose weighted average equals the constant temperature. But this is another story on which we are still working.

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Bamboosiella nov. gen. (Phlaeothripidae, Tubulifera) from India

By T. N. ANANTHAKRISHNAN, Lecturer in Zoology,
Loyola College, Madras (S. India)

Genus **BAMBOOSIELLA** nov.

Antenna 8-segmented, slender as in *Liothrips;* joint 3 emarginated within, 8 slightly narrowed at base, but not constricted, joint 1 narrowed towards apex; sense-cones rather long and fine, though on 3 and 4 *not* setiform. Head elongate, slightly narrowed towards base, widest across eyes, cheeks with a few weak spines especially in posterior third, as in *Hoplandrothrips.* Mouth-cone short, rounded, maxillary stylets confined to mouth-cone, very short, fine. Eyes large, oval; anterior ocellus on a slight elevation but not surpassing interantennal projection. Postocular setae long, knobbed, longer in the male. Prothorax much broader than head, heavy in the male, with black internal middle ridge. Bristles long, all knobbed, inner anteromarginals vestigial; epimerals single. Pterothorax tapering from the middle towards apex.

Legs slender, but forefemora of female distinctly, of male strongly enlarged, foretibiae unarmed, foretarsi of both sexes with tooth, stouter in the male. Wings narrowed towards middle, but from middle to apex little widened, with up to 7 double-fringe cilia. Tube short, conical, anal setae long, longer than tube, dark.

Bristle 2 of segment IX of male stouter, much shorter than bristle 1, though only spine-like. Bristles on IX (female) long, pointed nearly as long as tube.

Genotype—Bamboosiella bicoloripes sp. nov.

Dr. Priesner, who has kindly examined the specimens, informs me that this genus has very close resemblance to *Adraneothrips* Hood and *Hoplandrothrips* Hood. *Adraneothrips* differs from this genus in the smaller eyes, shorter prothorax, forefemora not or scarcely enlarged and cheeks unarmed. *Hoplandrothrips* has

long, closely approximated maxillary stylets (very short in *Bamboosiella*) and forefemora of male with one or two apical teeth. Similarly the genera *Apelaunothrips* Karny, *Phylladothrips* Priesner and *Mesothrips* Zimmerman, also show affinities, though much less than *Adraneothrips* and *Hoplandrothrips*. *Apelaunothrips* has similar coloration, but differs in the band-shaped maxillary stylets, short cephalic production, thin forelegs, unarmed tarsi and reticulate ocellar region. *Phylladothrips* on the other hand has short head, no double fringe, foretarsi of female and cheeks unarmed; *Mesothrips* also has head constricted at base, but antennae are thicker, joint 3 shorter and strongly conical, more strongly sclerotised in general.

I wish to express my sincere gratitude to Dr. Priesner of Egypt for kindly examining the specimens and for his invaluable advice and suggestions.

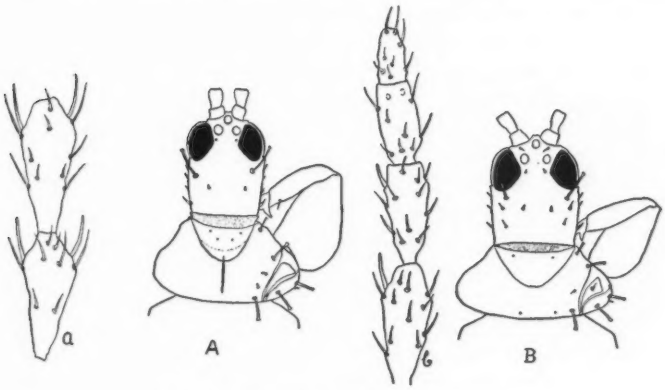
Bamboosiella bicoloripes gen. et sp. nov.

Macropterous female: Total body length * 1.862 mm. Abdomen bicolorous, segments I–VI almost yellow, VII–X blackish brown like head and thorax. Antennals 1, 2, 7 and 8 dark, the remainder pale yellow. All legs wholly yellow, coxae darkened; patches of red pigment scattered all over the brownish areas, except those of antennal region. Eyes dark, ocelli with dark red pigment. Wings hyaline, wing fringes brown.

Head elongate, 238 μ long from front margin of eyes, 196 μ wide across eyes, slightly narrowed at base (182 μ); cheeks with a few weak spines, the posterior-most one, the longest. Mouth-cone short, rounded, 84 μ long, 70 μ wide at apex, reaching the middle of the prosternum. Eyes large, oval, 98 μ long, 56 μ wide, occupying 0.4 time the head length; interocular space 70 μ wide. Ocelli well developed, anterior ocellus placed far forward, but not surpassing interantennal projection; posterior ocelli placed just above the middle region of eyes. Postocular setae 64 μ long, knobbed, placed 29 μ from cheeks and 26 μ from lower margin of eyes. Antenna 8-jointed, slender, nearly twice as long as head; joint I narrowed at apex; joint III emarginated

* Posterior abdominal segments little telescoped.

within; joint VIII narrowed slightly at base, but not constricted. Antennal joint III and IV each, with an outer and inner sense cone, *rather long and fine, not setiform;* joints V and VI each, with only an outer sense cone, slightly shorter than those on III and IV. Measurements of joints: Length(width) in μ: 38(38 at base, 35 at middle, 32 at apex); 51(26 at middle); 77(26); 83(26); 70(26); 58(26); 45(22); 32(13).



Bamboosiella bicoloripes gen. et sp. nov.

A. Head and prothorax of male.
B. Head and prothorax of female.
a. Antennal joints 3 and 4.
b. Antennal joints 5–8.

Prothorax 168 μ long at middle, shorter than head, being 0.7 time as long; much broader than head, 168 μ wide at anterior margin and 350 μ at base including coxae. Prothoracic bristles long, anteroangulars moderately so, knobbed; inner anteromarginals vestigial; anteroangulars 32 μ long; midlaterals 35 μ; epimerals 58 μ; coxals 43 μ. Pterothorax tapering from middle towards apex, 350 μ long and 378 μ wide at middle.

Legs slender but forefemora distinctly enlarged, 98 μ wide at middle; forefemora and tibiae unarmed, foretarsus with a distinct tooth.

Forewings 812 μ long, narrowed at middle, but, from middle

to apex, little widened, with 7 fringe cilia; basal wing bristles strong and well developed, measuring 38, 48 and 64 μ long, respectively, knobbed.

Abdomen narrower than pterothorax, widest across IV and V segments; wing retaining bristles well developed, 2 pairs in each of the segments II–VI. Bristle 2 of segment IX, 147 μ long, pointed, nearly as long as tube; tube short, about 0.65 time head length, 63 μ wide at base, and 35 μ wide at apex. Anal setae 182 μ long, longer than tube, dark.

Measurements in μ *(unless otherwise specified):* Total body length, 1.862 mm.; head, length 238; width across eyes 182; prothorax, length at middle, 168; width at anterior margin, 224; width at posterior margin, inclusive of coxae, 350; pterothorax, length 154; anal setae, length 182.

Habitat: *Holotype* on bamboo sheaths, 12–4–1954, Coimbatore, T.N.A. Colls. No. 256.

Male (Macropterous): General coloration and characters as in the female, but for the following: Postoculars longer, 67 μ; prothorax on one side in the allotype, with an abnormal additional epimeral bristle, while the normal condition for the genus is only one. Prothorax heavier than in female, with black internal middle ridge. Prothoracic bristles well developed; anteroangulars 32 μ; epimerals 57; coxals 42 μ long.

Forefemora strongly enlarged, 112 μ wide at middle, forefemora and tibiae unarmed, foretarsus with a stout tooth.

Abdomen widest at base, gradually tapering towards apex. Segments VII–IX 203, 168 and 98 μ wide, respectively. Bristle 2 of IX segment stouter and shorter than B.1; B.1 and B.2, 141 and 160 μ long, respectively. Tube shorter than head, half as wide at apex, as at base.

Measurements in μ*:* Total body length 1.918 mm. Head, length 217; width across eyes 154; eye, length 91; prothorax length at middle 182; width at anterior margin, 182; width at posterior margin inclusive of coxae, 308; pterothorax, length 308, width at middle, 322; tube length 140; width at base 49, at tip 28; anal setae, length 196.

Habitat: 2 males on bamboo sheath. 12–4–1954. Coimbatore, T.N.A. Colls. No. 256.

Insects Reared and Collected from the Pond Snail, Lymnaea palustris Müll., at London, Ontario

By W. W. Judd, Department of Zoology, University of Western Ontario, London, Ontario

In London, Ontario there is a small cat-tail marsh located at the south-east corner of Adelaide and Cheapside Streets, well within the built-up area of the city. On May 20, 1955 the marsh was dried up to the extent that there was no standing water in it and only damp mud formed its floor. On that day a large population of the pond snail, *Lymnaea palustris* Müll., was found on the mud. Most of the snails were crowded into the damper, shaded hollows while some were generally scattered over the mud. None of the snails were moving and each snail was withdrawn into the upper portions of the spiral of its shell so that no parts of the body could be seen. By cracking open the shells it was found that some of the snails were alive, while others were dead with the body flaccid and in various stages of decay. The living snails were found to be harbouring no parasites or predators, but several of the dead snails contained wriggling maggots. During the next two weeks collections of the snails were made in the marsh and insects were collected or reared from them, as related in the following account. All specimens are deposited in the collections of the Department of Zoology, University of Western Ontario except a few retained in the United States National Museum (U.S.N.M.), as noted.

Collections

1. May 20—One dipterous larva, collected from a snail, pupated and from the puparium there emerged on June 7 four wasps, *Aphaereta auripes* (Prov.) (Braconidae).

2. May 25—One beetle, *Glischrochilus quadrisignatus* (Say) (Nitidulidae) was found in a shell.

3. May 27—Two *Glischrochilus quadrisignatus* were found among shells in a hollow in the mud. Two rove-beetles, *Ale-*

ochara sp. and *Philonthus* sp., were found moving actively about in two shells. One wasp, *Aphaereta auripes,* was collected as it emerged from the mouth of a shell.

4. June 1—Six rove-beetles of the subfamily Omaliinae (*Omalium*? sp.) were collected from shells.

5. June 2—Eighty-five intact shells were collected and placed in two jars and adult insects emerging from them were collected and the dates of their emergence were recorded, as follows: June 11—1 *Athyroglossa*? sp. (Ephydridae); June 12—1 *Athyroglossa*? sp., 2 *Sarcophaga sinuata* Mg. (Sarcophagidae); June 13—1 *Sarcophaga melampyga* Ald., 1 *Sarcophaga* sp.; June 17—1 *Pherbellia fuscipes* (Macq.) (Sciomyzidae), 1 *Pherbellia nana* (Fall.), 1 *Phygadeuon*? sp. (Ichneumonidae), 10 *Aphaereta auripes* (Prov.); June 18—1 *Pherbellia fuscipes* (Macq.); July 3—1 *Muscina stabulans* (Fall.) (Anthomyiidae), 1 *Chlaenius sericeus* Forst. (Carabidae); Aug. 5—1 *Muscina stabulans* (Fall.).

Discussion of Collections

Coleoptera

The ground beetle, *Chlaenius sericeus* Forst., was in its teneral condition when it appeared, so it must have emerged from a pupa formed in the snail shell. This species is recorded by Blatchley (1910) as being "common about the margins of ponds, lakes and streams." Carabid beetles are known to be predaceous upon snails (Boettger, 1934, 1935, Ingram, 1946 and Schaeffer, 1931). The most prevalent beetles in the collections were the staphylinid beetles of the genera *Aleochara, Omalium*?, and *Philonthus.* When the shells were picked up these beetles emerged rapidly from the mouth of the shell and attempted to escape to cover. The three *Glischrochilus quadrisignatus* were found in or by the shells. Parsons (1943) records that this species breeds in fleshy fungi and that other nitidulid beetles breed in carrion and are predaceous on insects.

Hymenoptera

Muesebeck *et al.* (1951) list several species of calyptrate flies as hosts of *Aphaereta auripes*. The wasps that appeared on June 7 emerged from a puparium and those that emerged on June 17 were doubtless parasites of puparia in the shells collected on June 2. The 15 specimens are deposited in the U.S.N.M. Muesebeck *et al.* (1951) record that wasps of the genus *Phygadeuon* are parasites of muscoid flies. It is likely that the ichneumonid wasp that emerged on June 17 was a parasite on one of the flies predaceous on the snails.

Diptera

Two ephydrid flies, *Athyroglossa*? sp., were the first flies to emerge from the snails collected on June 2. The two specimens are deposited in the U.S.N.M. One specimen of the non-biting stable-fly, *Muscina stabulans,* emerged on July 3 and the second was found in the jar on August 5 when the collection of shells was discarded. At least two species of *Sarcophaga* (*melampyga* and *sinuata*) were reared from the snails. Berg (1953) reports that flies of the families Ephydridae, Anthomyiidae and Sarcophagidae have been reared from snails. Of the three specimens of *Pherbellia* that emerged from snails, one of *P. fuscipes* is deposited in the U.S.N.M. Berg (1953) records that flies in several genera of Sciomyzidae are predators of snails but does not include *P. nana* or *P. fuscipes.*

Acknowledgments

Dr. H. van der Schalie, Curator of Mollusks, Museum of Zoology, University of Michigan, kindly identified the snails as *Lymnaea palustris* Müll. Identifications of insects in several families were made by the following taxonomists of the United States National Museum:—L. L. Buchanan (Carabidae), L. M. Walkley (Nitidulidae), C. F. W. Muesebeck (Braconidae), R. E. Warner (Ichneumonidae), W. W. Wirth (Ephydridae), C. W. Sabrosky (Anthomyiidae, Sarcophagi-

dae, Sciomyzidae). Dr. C. H. Seevers, Roosevelt University, Chicago, identified the Staphylinidae.

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A New Species in the Genus Arachnoproctonus (Hymenoptera: Psammocharidae) with Photomicrographs of the Genitalia and Subgenital Plate

By R. R. DREISBACH, Midland, Michigan

Until the writer's description of *Arachnoproctonus occidentalis* (ref.), the species *A. relativus* (Fox) was the only species known in this genus which had hair bands on the abdominal ventral segments in the male, very similar to those in the genus Anopolius. In working on a lot from the American Museum, another specimen with hair bands on the fourth and fifth ventrites turned up which had a distinctly different subgenital plate than either of the other two, and also with other differences. This is described below as a new species.

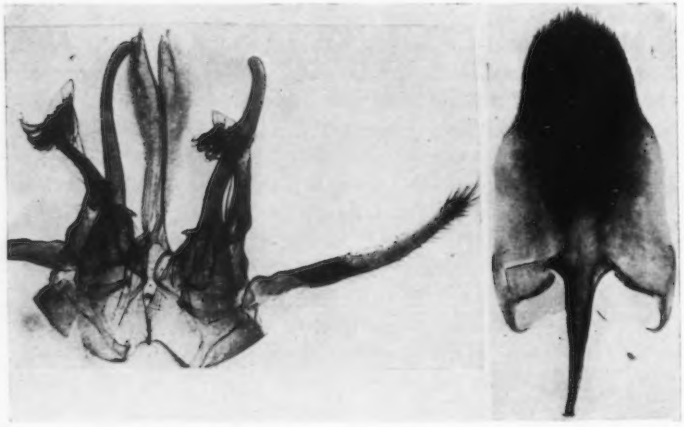
Arachnoproctonus variegatus n. sp.

Holotype male: Completely black, except for the apex of the mandibles which are reddish, rather long black hair on the vertex, shorter and thinner on clypeus, pronotum, sides of thorax and propodeum; heavy hair brushes on the ventral parts of the

fourth and fifth abdominal sternites, these bands over whole length of segments, and hair of same length on each; when seen from the side, nearest of posterior ocelli just barely visible and the front below anterior ocellus barely raised above the eyes, clypeus almost flat but slightly bowed in the middle, practically no posterior orbits; when seen from the front, the vertex sloping slightly above the eyes with a slight mound, which contains the ocelli, the head width almost equal to the length (0.88); interocular distance equal to 0.63 × transfacial distance at greatest eye width; vertex width equal to the interocular at the clypeus; clypeus twice as wide as its length; posterior ocelli slightly greater distance apart than their distance to the eyes (16:12); ratios of the first four and last two joints of the antennae are as 25:8:20:25:19:19. Thus it is seen that the first and fourth joints are slightly longer than the third; the third, fourth, fifth and sixth joints with ventral surface flattened slightly; the pronotum rises in a smooth curve from the neck to the dorsal surface, posterior edge slightly triangular and curved; propodeum with short upright hair on dorsal border and covered with whitish, very short, almost appressed hairs on posterior edge, this is the only silvery hair on the body; the third intercubital vein slopes backward, is slightly wavy but almost straight; the first intercubital vein is strongly arched inward, that is convex; second cell is longer on the cubitus than on the marginal vein; second and third cubital veins are only about 3 × their width apart on the marginal vein; the length of the two cells on the cubitus almost equal; basal vein interstitial with the transverse in the forewings, and in the rear wings the cubitus and the discoidal are also interstitial; the wings are very dark colored, more so at the apex; the abdomen increases in width slightly from the base to the middle of the second tergite and then decreases to apex of abdomen; the first tergite on the apical half covered with fairly long hair; legs are fairly well spined as is usual with the genus; ratios of the joints of the posterior legs starting with the femur are as 90:115:90:45:27:22:28. The longer spur of the posterior legs is equal to 0.7 the length of its metatarsal joint.

Genitalia similar to *relativus* but with the hair tufts on volsellae with the hair shorter and with knobs at tip of hairs not quite as large, and with fewer long hairs at base of volsellae; subgenital plate with basal two-thirds of plate almost parallel-sided (slightly tapering toward apex) with sides at middle of this part sinuous; apical third of plate suddenly narrowed and slightly tapering to broad fairly long haired apex; length of head and thorax 6.0 mm; abdomen same length; forewing 8.6 mm long; rear wing 7.3 mm long; genitalia length 1.32 mm, width 0.86 mm, subgenital plate 1.66 mm long, 0.73 mm wide.

Holotype male: N. Mexico only data (Am. Mus.).



Arachnoproctonus variegatus n. sp.
Genitalia and subgenital plate × 45

Key for Separating the Three Species with Ventral Hair Bands

1. Hair bands on fourth and fifth ventral segments; genitalia with a very large hair tuft of long hair, bent at right angles near tip and clubbed at tip, near apical part of volsellae but with apex bare of hair; wing heavily infuscated, posterior femora compressed.....2

1. No hair bands on ventral segments, nor with the long heavy tufts of hair on volsellae.....Remaining species of Genus
2. Hair band on fourth ventral not prominent, of much shorter hair and less well haired than the fifth, which is long haired and prominent; third antennal joint shorter than both the first and fourth, only 5/6 as long as fourth, twice as long as wide; interocular distance 0.58 as long as transfacial at the widest point; subgenital plate slightly ovate-shaped but with apex broad across tip, widest about mid-length tapering to each end; parapenial lobes narrow and shorter than aedeagus. Over the whole of U. S.....*relativus* (Fox)
2. Hair band on fourth ventral with as long hair as the one on fifth; third antennal joint as long as or longer than either first or fourth, 1.04 and 1.26 as long respectively; interocular distance 0.50 and 0.63 times as long as transfacial; subgenital plates either parallel sided or much reduced in width on apical third.....3
3. Hair band over whole length of fourth and fifth ventrals, not so dense as next; subgenital plate parallel sided; parapenial lobes very wide at least twice as wide as the preceding and the following and longer than the aedeagus; volsellae with hair on hair tuft not as long nor with tips as bent as in *relativus,* tips blunt and with longer bare surface, while tips of the other two are more acute; third antennal joint 1¼ times as long as fourth and 1.65 times as long as wide; interocular distance 0.50 times as long as transfacial; head 0.94 times as long as wide. California.....
.....*occidentalis* Dreisbach
3. Hair band on fourth and fifth ventrals only over ¾ or less length of the segments (posterior ¾); subgenital plate with basal ⅔ almost parallel but sinuous and with the apical ⅓ suddenly reduced to a broad tip; parapenial lobes about like *relativus;* volsellae with tuft of hair shorter and tips not bent so much; third antennal joint about as long as first almost 3 times as long as second and slightly longer than fourth, 2.3 times as long as wide; interocular distance 0.63 times transfacial; length head 0.88 times as long as wide. New Mexico.....*variegatus* n. sp.

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Notes on a Stictia New to the United States (Hymenoptera: Sphecidae: Bembicini)

By Howard E. Evans, Cornell University, Ithaca, N. Y.

The genus *Stictia* includes some of our largest and most showy digger wasps. Only one species, the common "horse guard," *S. carolina* (Fabr.), is truly a member of the Nearctic fauna. One other species, the Neotropical *S. signata* (L.) has been taken in southern Florida and in southern California. It is now possible to add a third species, *S. vivida* (Handl.), to the list of species known to occur in the United States. Handlirsch (1890, Akad. Wiss. Wien, Math.-Nat. Kl. Sitzber., 99: 25–26) described this species from one female from "Mexico" and another female without locality data. Parker (1929, U. S. Nat. Mus. Proc., v. 75, art. 5, p. 35) recorded seven females from Alta Mira, Tamaulipas, Mexico. These are the only published records on this species, and the male has remained unknown.

From June 22 to June 28, 1956, Eric G. Matthews and myself collected insects in Cameron Co., Texas. Most of our time was spent along the shores of Laguna Madre about five miles west of Port Isabel. In this locality a great many Hymenoptera were taken on the flowers of black mangrove, *Avicennia nitida* Jacq., including four male *Stictia vivida*. We also discovered two female *vivida* nesting on the beach at Boca Chica, several miles south and east of Port Isabel. The nests were situated in rolling but fairly hard-packed sand well back from, but facing, the Gulf shore. The nests were of simple structure, with a burrow 60–68 cm long leading to a cell about 2 × 5 cm in size. Both nests contained fairly large larvae plus a few horseflies, *Tabanus texanus* Hine [det. L. L. Pechuman]. The females carried the flies in the usual manner of Bembicini and always closed the nest upon leaving.

Thus *Stictia vivida* appears to be well established in extreme southern Texas. I also collected the species on June 19, 1951, at Tecolutla, Vera Cruz, Mexico. In this locality nine females

were taken in sand dunes immediately behind the beach. These new records, along with Parker's record from coastal Tamaulipas, indicate that the species ranges along the Gulf shore for at least 400 miles. I have collected *Stictia* at several inland localities in Mexico, but have never taken *vivida* away from the sea beach.

Since the male has not previously been described, a few notes on its recognition may be in order. In both Handlirsch's and Parker's papers, the males key directly to *dives* (Handl.), a common inland Mexican species. They bear a close resemblance to *dives,* but differ in the following characters: labrum narrowly bordered with black, but with little or no black medially; yellow on the scutellum narrowly interrupted medially; penultimate sternite with moderately dense, short, suberect setae and with the specialized median elevation located at the extrem base and not conspicuous. The male *vivida* closely resembles the female in color pattern, differing chiefly in having less yellow on the mesopleura, in having the apical abdominal tergite marked with yellow, and in having the legs much more extensively marked with yellow.

More About Membracidae at Lights

By S. W. Frost, Pennsylvania State University

In 1955 [1] the writer reported large numbers of Membracidae taken at lights and noted that previously most entomologists considered they were not strongly attracted to light. During 1956, a trap operated in Centre County, Pennsylvania, attracted even larger numbers of these insects. This trap was equipped with a 60-watt tungsten filament lamp and was placed in a dense oak woodlot. Several nights during July unprecedented numbers of Membracidae were caught. Collections on the

[1] Ent. News, 66(3): 63–64, 1955.

nights of July 1 and 6 were selected for analysis. The insects were caught in a quart jar, containing kerosene, at the bottom of the trap. The Membracidae were separated from the other insects, dried and weighed. Immediately a sample was taken and the species of treehoppers determined as follows.

Membracidae taken at one light trap July 1, 1956, Centre County, Pa.

Species	Males 5-gram	Females sample	Estimation for total catch 54.5 grams
Cyrtolobus vau Say	424	0	4621.6
Cyrtolobus pallidifrontis Emns	2	1	32.7
Atymna querci Fitch	34	0	370.6
Ophiderma flavicephala Goding	115	0	1253.5
Smilia camelus Fab.	0	1	10.9
Total	575	2	6289.3

Membracidae taken at one light trap July 6, 1956, Centre County, Pa.

Species	Males 2-gram	Females sample	Estimation for total catch 20 grams
Cyrtolobus vau Say	395	3	3980
Cyrtolobus fenestratus Fitch	25	0	250
Atymna querci Fitch	18	1	190
Ophiderma flavicephala Goding	4	0	40
Total	442	4	4460

It is more evident than previously published that Membracidae, especially those of the Genera *Atymna, Cyrtolobus* and *Ophiderma,* are attracted in large numbers when lights are close to the infestations. It is also evident that the males respond more freely than the females.

Notes and News in Entomology

Under this heading we present, from time to time, notes, news, and comments. Contributions from readers are earnestly solicited and will be acknowledged when used.

Pacific Science Congress. The Ninth Pacific Science Congress will be held at Bangkok, Thailand, 18 Nov. to 9 Dec., 1957 (including post-sessional tours). Plans for the entomology section include sessions on problems in Pacific entomology; zoogeography of Pacific insects; fauna and ecology of Thailand (with Zoology); use of insecticides, their merits and hazards, and insects of medical importance (both with Public Health section); biological control of insects and weeds; insect pests of rice; coconut pests; ecology and control of the giant African snail; and quarantine. Also, participation in UNESCO symposium on climate, vegetation and land utilization in the humid tropics, and participation, with zoology and botany, in symposium on bibliographic problems in the Pacific. For the latter, the undersigned would like to receive information regarding bibliographies in preparation, or in existence, which include Pacific insects or relate to Pacific entomology, or suggestions for needs in this line.

It is hoped that as many entomologists as possible may try to get to the Congress, and that papers on the above, or additional subjects, may be submitted. Correspondence may be addressed to the undersigned, chairman of the Standing Committee on Pacific Entomology, at Bishop Museum, Honolulu 17. —J. L. GRESSITT

Fire at the Budapest Museum. During the revolution in Hungary in late 1956 part of the Hungarian National Museum in Budapest was burned. According to Mrs. J. J. H. Szent-Ivany who was working at the museum at the time, the Acarina, Orthoptera, neuropteroid and Diptera (except acalyptrates) collections were entirely destroyed (including a few thousand Diptera types), and the very important Horvath collection of Heteroptera was partly destroyed, but the Coleoptera and Lepidoptera collections remained safe, with only slight damage. Mrs.

Szent-Ivany escaped to Vienna with her daughter near the end of the year, and both are joining Dr. Szent-Ivany in New Guinea.—J. L. GRESSITT

New Book on Tropical American Butterflies. The American Museum of Natural History is about to publish "BUTTERFLIES OF THE AMERICAN TROPICS—The Genus Anaea (Lepidoptera Nymphalidae)—a study of the species heretofore included in the genera *Anaea, Caoenophlebia, Hypna, Polygrapha, Protogonius, Siderone,* and *Zaretis*" by William Phillips Comstock.

From advance specimen pages sent out it is evident that this will be a large and beautiful volume. The page size, trimmed, is 9¾ x 13 inches, and there will be xvi + 276 pages and 30 full-page color plates. Dr. A. B. Klotz has spoken very highly of the scientific value of this work and also points out that . . . "because of its superb beauty of illustration and excellence of design, [it] is destined to have the strongest appeal to bibliophiles the world over, as well as to everyone genuinely interested in natural history. I am afraid that we in the United States have lagged behind in the production of such books. This one, happily combining great intrinsic scientific worth with illustrative artistry of the highest calibre, will do much to redeem us."

Because of the great costs of the 30 color plates it is necessary for the American Museum to obtain in advance an indication of the demand for such a book, as well as for a series of such books on butterflies and on other groups that is under consideration. The pre-publication price is $20.00 per copy. After publication the price will be $25.00. Orders should be sent to: The American Museum of Natural History, Central Park West at 79th Street, New York 24, N. Y. If British sterling is more convenient, send orders direct to the printer, W. S. Cowell, Ltd., Butter Market, Ipswich, Suffolk, England.

Summer Grants at Oklahoma. The National Science Foundation has provided funds for a number of grants-in-aid for students and investigators during the summer session at the University's Biological Station, Lake Texoma. Both post- and

pre-doctoral grants are available, from $200, $350, to $500 each. Applications should be sent before April 10 to Carl D. Riggs, Director, University of Oklahoma Biological Station, Norman, Okla.

Reviews

Ross, Herbert H. 1956. Evolution and Classification of the Mountain Caddisflies. University of Illinois Press, Urbana. vi + 213 pp. Price: $6.00.

Though this volume treats, in detail, only the families Philopotamidae, Rhyacophilidae and Glossosomatidae, it is in reality far broader in its scope than the title would indicate.

In the introduction Dr. Ross treats of such concepts as "living fossils," "primitive, generalized and specialized" and "dispersal." These concepts, basic to any discussion of phylogeny, are briefly and lucidly defined. This is followed by an excellent discussion of the evolution and origin of the caddisflies as a whole. The main part of the book consists of a detailed treatment of each of the above mentioned families. For each family the evolution and dispersal of the genera and species is given followed by a systematic treatment of the family with keys to genera and species.

The last major section is concerned with the dispersal in geologic time of the above three families. This is a difficult and, to a large extent, speculative subject—involving as it does the superimposition of the aforementioned evolutionary and dispersal data upon the geologic and ecologic history of the earth. This task is very ably handled here and this section could serve as a model for this type of study. The volume is well worth reading by any student of systematics and evolution, regardless of his particular field of study.—Selwyn S. Roback.

Systematics of the Suborder Tubulifera (Thysanoptera) in California. By H. Edwin Cott. University of California Publications in Entomology, Vol. 13. (University

of California Press, Berkeley and Los Angeles.) 216 pp., 4 pls. 1956. Price: $3.50.

This is the first analytical work of size on a thrips fauna to appear in America since Hinds' monograph in 1902. Although limited to California, which is relatively depauperate in representatives of Tubulifera as compared to the eastern and tropical regions of North America, Cott's work is of wide significance because it summarizes the taxonomic criteria and methods commonly used in the study of the suborder. Furthermore, because intergrading species between *Haplothrips* and *Leptothrips* and between *Liothrips* and *Rhynchothrips* flourish in California, Cott is able to bring meaningful attention to the problem of delimiting these extensively distributed genera.

In all, Cott treats 29 genera and 60 species, of which 12 of the species are new. His classification is a conservative one following closely the system proposed in 1927 by Priesner. Each genus is redefined and is discussed with particular reference to affinities and taxonomic status. The species are described in detail and type localities, hosts, distribution, and material studied are given. The keys appear to be workable.

Of general interest to entomologists is Cott's break with tradition in referring to the immature stages of thrips as nymphs and pseudopupae rather than as larvae and pupae. His argument for this nomenclature is that it is in keeping with the nomenclature used for other insects having paurometabolous development.

This careful study provides the specialist with much new information on a heretofore little known fauna and, of equal importance, it provides interested entomologists with the first modern American guide to a portion of the Tubulifera.—Lewis J. Stannard, Jr., Illinois Natural History Survey, Urbana.

A Textbook of Entomology by Herbert H. Ross. Second edition. John Wiley & Sons, Inc., New York, Chapman & Hall, Ltd., London. 1956. Pp. xi + 519. Price: $7.50.

The first edition of this textbook was reviewed in ENTOMOLOGICAL NEWS for May, 1949 (Vol. 60: 139). This second edition maintains all the virtues described in that review, and we may affirm in 1957 that this is still the only American textbook that will provide the student with an introduction to the science of entomology as it exists to-day. Covering, as it does, so wide a field in only 500-odd pages, it necessarily concerns itself with fundamentals to the exclusion of minor detail. Each chapter, whether it deals with the history of the subject, external or internal anatomy, physiology, life cycles, the orders of insects, geological history, ecology, or control, is very skillfully written so as to present the basic facts concisely, and in simple language. In spite of treating the subject from such a broad standpoint, the study of the insect orders is by no means slighted. Under each order there are keys to the principal families with line drawings illustrating all the characters used in these keys, and there are the customary habitus pictures of representative forms, and descriptive text.

The entire book has been re-set in a different style of type and with more pleasing headings. A great improvement in general appearance has also resulted from re-drawing and making new engravings of most of the numerous anatomical illustrations. The convenience of having each anatomical part labelled directly with its name instead of with a symbol will also be appreciated.—R. G. SCHMIEDER.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

Conopidae of the World wanted. Will pay 10¢ to $1.00 for pinned and labelled specimens. S. Camras, 4407 N. Milwaukee Ave., Chicago 30, Illinois.

Anisoptera—Nearctic sp. wanted for exchange, espec. Ophiog., Arigom., Aeschna, Neurocor., Somatoc., Cordulia, Dorocor., Leucor. R. D. Cuyler, Dept. of Entomology, N. C. State College, Raleign, N. C.

Bembicini and Stizini (Hym., Sphec.) of New World wanted for revis. study. Will return upon request or at end of project. James E. Gillaspy, Dept. of Zoology, Univ. Texas, Austin 12, Texas.

Agapema galbina. Will exchange cocoons of this moth for nature books. E. Frizzell, Route 4, Box 96, San Benito, Texas.

Tenebrionidae of the World wanted, in exchange for insects of Argentina and neighboring countries. Horacio J. Molinari, Av. Lib. Gral. San Martin 55, Acassuso (Buenos Aires), Rep. Argentina.

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